

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

a semiconductor substrate, and

a circuit element using an insulating film formed
5 on said semiconductor substrate,

said insulating film containing a silicon compound
containing at least one element selected from the group
consisting of an oxygen and a nitrogen, and a metal
compound containing a metal other than silicon and at
10 least one element selected from the group consisting of
an oxygen and a nitrogen, nano-crystals being formed in
said insulating film, the size of said nano-crystal
being small enough to permit observation of a
polycrystalline ring as a diffraction image when an
15 electron beam having a beam diameter of the nanometer
order is incident in parallel to said insulating film
surface.

2. The semiconductor device according to claim 1,
wherein said a silicon compound is a compound selected
20 from the group consisting of a silicon oxide, a silicon
nitride, and a silicon oxynitride.

3. The semiconductor device according to claim 1,
wherein said nano-crystal grains are made of said metal
compound.

25 4. The semiconductor device according to claim 2,
wherein said nano-crystal grains are made of an oxide,
a nitride or an oxynitride of a metal other than

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forming insulating film being a mixed film including a silicon compound containing at least one element selected from the group consisting of an oxygen and a nitrogen, and a metal compound containing a metal other than silicon and at least one element selected

from the group consisting of an oxygen and a nitrogen on a semiconductor substrate under temperatures at which crystallization does not take place; and

applying a heat treatment to precipitate a nano-
5 crystalline metal oxide within said mixed film.